



THE SAN FRANCISCO QUARANTINE STATION.

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TO INTERFERE with commerce and commercial interests as little as is consistent with the sanitary safety of the whole country; to ever hold its health interest more important, but never to forget that commercial well-being is also essential to the country; that undue interference with commerce entails poverty, that poverty itself brings unsanitary conditions, and consequent sickness and death; that, therefore, while neglect of sanitation is a crime against nature and the body politic, illogical, misdirected, over-zealous efforts in sanitation may defeat the very object of all sanitation; the preservation of the well-being, the increase of happiness and longevity of the individuals forming a community or a nation, should be the object of every sanitarian. The ability to rightly balance the two interests—sanitary safety, commerce—which, from a broad standpoint, are interdependent, but which, in individual cases, seem widely opposed, constitutes the true sanitarian, but especially the successful quarantine officer. Quarantine, therefore, does not guarantee absolutely the prevention of the importation of a case of infectious disease, nor does the most perfect fire department or regulations do away with all fires, or double track and block system stop all railroad accidents; but, because of this we do not stop all commerce with infected ports, forbid all fires in cities, or cause all railway trains to cease running; nor would we throw away all railway signals, break up all fire apparatus, or abolish all quarantine restrictions. On the other hand, we should require such buildings as will lessen the danger if fire should start, and communities should recognize that, while outposts and guards are essential and should demand the best possible quarantine, they should also place themselves in such sanitary condition that even if dis-

ease should gain entrance, it would find little opportunity to spread.

The National Quarantine Station for the port of San Francisco, conducted by the Public Health and Marine Hospital Service of the United States, is, in a quarantine sense, the "heir of all the ages," and it is "in the foremost ranks" of the quarantine stations of the world. Its equipment is the result of evolution and the survival of the fittest in inspecting, disinfecting and detention facilities, and the rules governing it.

"The Quarantine Laws and Regulations of the United States, 1903," are the most enlightened, logical and scientific governing any country. While it is true that even the earliest laws of Virginia, Pennsylvania, Massachusetts and one or two other colonies, provided for detention and disinfection by the air, sun or fire, of infected vessels, and that Congress, in 1799, passed a national quarantine law requiring all officers of the United States to assist in executing state quarantines and directing Collectors to require a pratique, it is equally true that modern quarantine methods were not begun until about 1880.

Surgeon-General John W. Woodworth, in a notable address before the International Medical Congress, Philadelphia, 1876, presented conclusions adopted by the Congress, recommending port and internal sanitation, etc., and after a series of investigations by Congress, the American Public Health Association and others, which showed inadequate, barbarous laws and worse practices in some of the states, the law of 1878 was passed, giving authority to the Marine Hospital Service.

In 1879 the National Board of Health, composed of appointees from various states and the three Services, started four "stations of refuge" on the Atlantic coast, for infected vessels from

inadequately equipped state and local stations, but no station on this Coast. In 1883 the quarantine functions reverted to the Marine Hospital Service.

In 1883 the Governor of California applied to the Marine Hospital Service for the establishment of a national station at this port, on account of the danger of introduction of yellow fever from the Mexican coast, where it was raging; and of cholera and smallpox from the Orient. There was, unfortunately, no available money for the construction of a permanent station, and the authorities of San Francisco, while willing and ready for a permanent station, declined the proffer of a boarding station and an inspector.

In 1885 recommendations were again made by the Marine Hospital Service for the establishment of a government station at this port, and attention was called to the fact that there was no effective quarantine on the Pacific coast, despite yellow fever, cholera and smallpox threatening it. In 1886 this recommendation was renewed, and a board of medical officers of the Army, Navy and Marine Hospital Service, selected the present site.

August 1st, 1888, "an act to perfect the quarantine service of the United States" was approved. This act provided that the quarantine should be conducted by the Marine Hospital Service, in accordance with the act of April 29th, 1878, and provided for stations at San Diego and Port Townsend, and also contained the following:

For the quarantine station at San Francisco, California: Hospital buildings and officers' quarters, disinfecting machinery, warehouse and wharf, steam tug, small boats, expenses for the fiscal year eighteen hundred and eighty-nine, one hundred and three thousand dollars.

A board appointed to select a site, consisted of the Collector of Customs, the President of the State Board of Health of California (R. Beverly Cole, M. D.) and Surgeon Sawtelle, M. H. S. then on duty at the Marine-Hospital.

The War Department, on request, transferred a part of Angel Island, in San Francisco harbor, for the station. The Service, recognizing the importance of San Francisco, planned a complete equipment for the station. No time was lost in planning or construction; work began on April 15th, 1890; the wharf and buildings were finished on December 30th, 1890, and the disinfecting machinery about January 15th, 1891. The station thus completed, cost \$97,841.00. A fumigating steamer, equipped with sulphur furnace, was completed in 1892, at a cost of \$28,900.

In 1893 the U. S. S. *Omaha* was transferred by the Navy, and made suitable for the detention of suspects. In 1895 the fumigating steamer *George M. Sternberg* was made a boarding steamer, and the hulk *Omaha* moved from the cove to an anchorage, and used as a fumigating hulk. In 1895 a fast steam launch, the *Bacillus*, was con-

structed at a cost of \$3000, and \$5000 appropriated for a bath house for passengers, and a laboratory fitted out sufficiently for all ordinary purposes.

Under the act of Congress approved June 6th, 1900, there was appropriated for improvements: Iron pier for disinfecting plant, \$100,000; electric light plant, \$10,000; additional accommodations for cabin passengers, \$10,000; water system, \$5000; heating apparatus, \$2000; extension of disinfecting and isolation buildings, \$3500; disinfecting and laundry appliances, \$1200; in all \$131,700.

A board of pilots, and others, decided that it would be hazardous to dock the immense vessels now plying to this port at any pier built at the station; other sites could not be secured from the War Department, and a floating plant was decided upon, but has not yet been constructed.

Plans are now completed for a suitable boarding tug to take the place of the converted fumigator *Sternberg*, whose usefulness has been outgrown by the commerce of this port.

The station is situated on Angel Island, about five miles north of San Francisco, being located in Hospital Cove, a quiet little valley on the north shore of the island, surrounded by precipitous hills, green all the year, and is a place of great natural beauty. It is well sheltered from the fogs and winds; is sufficiently distant from the city, and, aside from the swift currents of Raccoon Straits, which separate it from Marin County shore, is an ideal site for a quarantine station.

The equipment of the station can perhaps be best described by taking an instance when a large liner is detained for disinfection, and detention of her personnel for observation during the incubation period of the disease which causes her disinfection. The instant the quarantine officer decides it is necessary to hold her, the vessel weighs anchor and leaves the inspection ground for the hulk *Omaha*. Passengers and mail are handled first, and, as on the vessel, the personnel must be kept in the following groups: Cabin passengers (first and second), European steerage, Asiatics, and of these, Chinese and Japanese must be separated. The crew is separated in a similar manner. Passengers, with their baggage, are transferred by steamers to the station. Here they land upon a wharf 271 feet long, with an arm 104 feet; upon the wharf is a large building with two rooms. Gate, partitions and doors separate the whole north wharf building and grounds from the rest of the station, all persons going through bath houses, and effects through the disinfecting chambers before going to the barracks. In this north, or "infected" room, are small wire cages; each person is directed to divide his effects into two lots, one of goods not injured by steam, the rest for formal-

dehyde. Directions are printed upon the walls, and trained officers and attendants, including a female trained nurse for women, watch every process. The cages are now placed upon flat cars standing ready upon a track which makes a circuit from infected room through disinfecting chambers, to clean end of shed and wharf.

The disinfecting house is a large building, 92x54 feet, divided into two rooms by a tight partition; adjoining it are the boiler house and steerage dressing room, the whole having a cement floor. In this house, with one end of each projecting into the "clean" room, are three cylindrical, double jacketed chambers for the disinfection of clothing, mail, baggage, bedding, etc. Each chamber is forty feet long and seven feet in diameter, and all have steam supply and return pipes, gauges, safety valves, pressure regulators and thermometers which show the temperature of both jacket and interior. Each is connected so that either steam or formaldehyde may be used. Let us take the chamber containing bedding, etc., to be steamed. Steam is already circulating in the jacket and the chamber is warm; doors at either end are hermetically sealed, and a steam ejector in one minute makes a vacuum of fifteen inches in the huge chamber; the heat from the jacket soon warms the contents and live steam is now streamed into the chamber until a pressure of ten pounds is reached. After the thermometers have shown a temperature of 104° to 105° C. for not less than twenty minutes, the steam is turned off and a vacuum is again created, the hot jacket soon drying the contents of the chamber. Air is now turned in and the contents removed by opening the clean end, out of which the cars run on to a turn table, thence to be repacked. In the case of trunks, pictures, fine silks, leather goods, etc., a vacuum of 15 inches is made, as in the case of steam, and held until the thermometer shows a temperature of 60° C., when formaldehyde gas, evolved from a mixture of neutral salt and formalin, in an autoclave, under pressure, using not less than 30 ounces of formalin (40%) to the 1000 cubic feet, is injected. After a total exposure of one hour, the vacuum is made.

Having sorted their clothes, passengers are now conducted to the steerage or cabin baths. In the former every particle of effects is left in the disrobing room, whence it goes to the cars under supervision of attendants; each person is given soap and towel and after a warm shower bath of fresh or salt, or bichloride of mercury water, and inspection while nude by a medical officer, goes through another room where he is given a suit of clothes and slippers which he wears while waiting for his disinfected clothes.

Cabin passengers have a house containing waiting rooms with open fires, etc., at either end.

Each person goes into a little disrobing room, thence into a small shower bathroom, where, after a bath, he is furnished bath robe and slippers, and then waits in the clean end. The sexes are kept separate and a trained nurse is with women and children.

Each person landed having now been separated from the source of infection, whether it be the vessel, the sick, his own clothes or personal effects, and all that he has being "clean," the problem of taking care of the personnel for observation during the incubation period of the disease remains.

Along the walk from the clean end of the wharves and disinfecting sheds are two long buildings with bunks which will accommodate 576 Chinese steerage; behind them are lavatory and trough toilets, and nearby is a Chinese "kitchen." Surrounding this compound is an eight foot barbed wire fence. Passing a gate we come to a large one-story building with kitchen and dining room in front and behind, two large rooms separated by a hall, each with toilet. Upon canvas bottom cots in tiers, are standees for 176 Japanese steerage, one room for each sex. A barbed wire fence and solid partitions on verandas, make this another compound.

Next is a similar building, the front of which is used as executive offices, dispensary and quarters for a trained nurse; behind these are two rooms with hospital beds and tables, with two well-equipped bathrooms. These rooms accommodate about twenty-six people and are for ordinary cases of illness during detention, but on account of lack of room, are sometimes used for cabin passengers.

Next along the water front is the new building for cabin passengers. This is a T-shaped, two-story building. The long arm has verandas upon which open a series of staterooms each with two berths of hair mattresses over wire springs, lavatory with running water, electric lights, mirror, folding table and hot water heat. Ample toilet and bath facilities are provided for each sex. In the first floor of the transverse arm are a large dining room, kitchen with ranges, etc., and above are seven rooms. This building accommodates about sixty-eight persons. Still further to the west along the shore, we come to another "compound" containing two connected houses, one of which is used for detention of ships' and customs officers or passengers, the other for attendants. There are accommodations for thirty-six people here. So much for the well; but before any of this is done, the sick are removed from the vessels.

For the isolation and treatment of contagious diseases there are two groups of buildings, each with an eight foot wire fence forming a "compound," separated from each other and from

the rest of the station; each is, in fact, a sub-station. One compound is upon the bluff at the extreme northeast point of the station, seventy-five feet above water. One building contains a ward, three rooms, bath and toilet and hall with kitchen beneath; the other building has two rooms and toilets for medical officer and nurse.

There are telephone and electric lights from the station, and hot water heat. In a beautiful little cove, several hundred feet to the east, accessible by water, is a similar "isolation compound" of three buildings. On the east side of the island is a large detention camp, used for overflow crowds of troops, etc.

The wisdom of having isolation facilities for more than one disease is evident, because all have been in use simultaneously twice within the past three months.

On a hill above the Oriental barracks, are two one-room observation buildings, each isolated by wire.

If, during the inspections given detained passengers, any suspicious case is detected, it is removed to these buildings, thence to the non-contagious or isolation hospitals, as may be. Nearby is a laboratory building, well equipped for diagnosis, the room for infected animals being concrete. In a distant building are kept healthy guinea pigs, rats and pigeons for diagnostic purposes. Under the isolation hospital bluff, next a separate landing, is a brick oil-consuming crematory for bodies dead of quarantinable disease. Toward the main group is a corrugated iron building containing the electric light plant, which, with its two dynamos, direct and storage batteries systems, runs the arc and incandescent lights over wharves, buildings and grounds.

Nearby are the animal house, machine, carpenter, paint and smith shops. Behind the executive building is a completely equipped steam laundry. Fire protection is afforded by two pumps which throw sea water to tanks 275 feet above the station, thence by gravity through a system of pipes the water is distributed to water plugs. Fire drill is required by regulation at least once weekly.

The fresh water supply comes from a spring 285 feet above the station and from a 6-foot well sunk 75 feet to solid rock, with two thirty foot galleries. Water is pumped to these tanks, capacity 51,000 gallons, thence distributed by gravity, and the water shed and pump house are protected by eight-foot wire fences.

Suitable quarters for the commanding and junior officers are provided in three buildings upon the hill, back of the other buildings.

The total normal capacity of the station is 1104 persons, (steerage 816, cabin 102, isolation buildings 8, non-contagious hospitals 35, "small-

pox compound" 9, "cholera or plague compound" 4, *Omaha* 130,) exclusive of station force. Fifteen hundred to two thousand persons, with baggage, can be handled in one day.

The reservation is so arranged that a system of barbed wire fences segregates various groups; all important buildings are connected by telephones and the commanding officer's quarters have connection with the city telephone system.

After the infected vessel is moored alongside the *Omaha* and the sick passengers, mail, carpets, bedding and most of the crew removed, disinfection begins.

Regulations prescribe that, in general, holds of empty vessels shall be disinfected by (a) exposure for twenty-four hours to $S O_2$, generated by burning 5 lbs. of sulphur per 1000 cubic feet, or liberated from 10 lbs. of liquid $S O_2$, sufficient moisture being present; (b) washing with 1-1000 solution of bichloride of mercury; for iron vessels either, for wooden vessels both methods are prescribed.

When the disinfection is for yellow fever or plague, a preliminary simultaneous fumigation by moist $S O_2$ is done for the purpose of destroying rats, vermin or mosquitoes. In the disinfection of cargo vessels infected with plague, after twelve hours' exposure to $S O_2$, the upper six-foot layer of cargo is removed during the day; the hold again fumigated at night, this process being continued until the entire cargo is discharged.

Living apartments, cabins and fore-castle are disinfected by one of the following methods: (a) Sulphur dioxide 5%; (b) formaldehyde gas, using not less than ten ounces per 1000 cubic feet; (c) washing with bichloride of mercury 1-1000; formalin 5%, or carbolic acid 5%, preference being given to last for metals or polished woods. Fore-castles, steerage, and compartments in bad sanitary condition, are disinfected by (a) sulphur followed by (b) a solution.

Small vessels with empty holds are best disinfected by moist $S O_2$, generated by burning sulphur in open pots set between decks or elevated above the bottom, in larger pans of water. The disinfection of such sailing vessels is no more like the disinfection of a huge, complicated system of holds, bunkers, ballast tanks, ventilators and living apartments, such as a big liner, than incising a boil is like a difficult brain operation.

The use of liquid burning sulphur in small pots, closed in cargo holds containing valuable cargo, is of course out of the question.

Upon the disinfecting hulk *Omaha* are two double end furnaces, in which sulphur is burned, not less than $5\frac{1}{4}$ pounds per 1000 cubic feet to be disinfected. $S O_2$, the product of this combustion, is led through a pipe to an iron tank or reser-

voir, whence the gas is forced through a 12-inch iron pipe, along the side of the hulk. At short intervals are reducing elbows, to which are coupled 6-inch flexible rubber hose, the other end of which is led aboard the infected vessel, well down toward the bottom of the hold. A small pipe carries steam necessary for formation of moist gas, into the hold. Forecasts, storerooms and similar small accessible places, are disinfected by a solution of glychochloroformol under pressure in an autoclave or by sulphur pots. Before closing the vessel, careful search should be made for hidden articles of clothing and possible stowaways. Effects ("dunnage") have been found in furnaces not in use, under coal, in ventilators, wrapped in sails—in fact, everywhere—and they are likely to be the effects of the sick or dead. Stowaways may be *anywhere*. Effects of the crew, carpets, bedding, etc., not already sent for disinfection, are now disinfected in a 16-foot, double jacketed chamber on the hulk, similar to the large ones at the station.

After the fumigation, the disinfection solution is forced by steam pumps from the tanks on the hulk, through hose led aboard the vessel, and empty holds, forecasts, etc., cleaned under pressure. Staterooms and cabin must be gone over by hand. The vessel is now mechanically, and from a quarantine standpoint, clean; she is "free from danger of conveying quarantinable disease"; her owners are, therefore, given the privilege of placing a crew aboard and putting her in commission, her old crew being held for observation.

Not all vessels quarantined should be, or are, subjected to such disinfection throughout. A case of smallpox, for instance, breaking out a few days after embarkation, was clearly infected ashore. Cargo holds, several hundred feet away and battened water tight since, for instance, leaving Shanghai, could scarcely be infected by such a case embarking at Yokohama.

Here the quarantine officer must use his own judgment, uninfluenced by ignorant or malicious criticism, or by the natural desire of the vessel's owners to avoid delay and expense, or by an unreasonable desire to be absolutely sure of a perfectly aseptic vessel. It is his duty to disinfect, when reasonable doubt exists after careful consideration.

Important and interesting as equipments for disinfection, isolation and detention are, the crucial test of the work of a quarantine station is the inspection of incoming vessels. The laws provide that vessels arriving at ports of the United States under the following conditions, shall be inspected by a quarantine officer prior to entry: (a) All vessels from foreign ports; (b) any vessel with sickness on board; (c) vessels from domestic ports where cholera, plague or yellow fever prevails, or where smallpox or typhus fever prevails

in epidemic form; (d) vessels from ports suspected of infection with yellow fever, having entered a port north of the southern boundary of Maryland without disinfection, shall be subjected to a second inspection before entering any port south of said latitude during the quarantine season of such port.

Vessels arriving under the following conditions, shall be placed in quarantine: (a) With quarantinable disease on board, or having had such disease on board during the voyage; (b) any vessel which the quarantine officer considers infected; (c) relates to vessels from yellow fever ports during the open season, May 1st to November, arriving at ports south of Maryland, direct or via other ports.

The quarantinable diseases are cholera, yellow fever, smallpox, typhus fever, leprosy and plague. When vessels arrive with other communicable diseases, as scarlet fever or measles, local health authorities are notified.

Under the wise law of 1893, and the wise and broad minded administration of Surgeon-General Wyman, the inspection of vessels is now really begun at the port of departure. Any vessels clearing from a foreign port, for any place in the United States, must secure from the consular officer or from the medical officer, where such officer has been detailed by the President for that purpose, a bill of health, setting forth sanitary history and condition of said vessel, its cargo, passengers and crew. The President, in his discretion, is authorized to detail medical officers to serve in the office of the consul at any foreign port, for the purpose of furnishing information and making the inspections required before the giving of said bill of health.

Under this law, this service maintains medical officers at Calcutta, Hong Kong, Shanghai, Nagasaki, Kobe, and Yokohama; the quarantine officers at Manila and Honolulu acting in the same capacity. Such officers are directed to make such an examination of vessels, cargo, passengers, crew, personal effects of same, including manifests, food and water supply, the ascertainment of its relations with the shore, the manner of loading and possibilities of invasion by small animals, as will enable the quarantine officer here to determine if regulations have been complied with.

Steerage passengers and forecastle crews are bathed, their effects disinfected, and their temperatures taken before embarkation. Manifests of freight, especially food products, hides, etc., must be certified as inspected and passed. The anchorage ground for vessels before inspection is between a line from Alcatraz Island to Meiggs' Wharf, and the Golden Gate.

Boarding is done by two medical officers stationed upon the boarding steamer *George M.*

Sternberg, as soon as a vessel flying a yellow flag anchors. When transports or large liners arrive, as well as in the case of suspected vessels, the quarantine officer, four junior medical officers and a female inspector, go aboard. Temperatures or glandular examinations, or both, are taken of the personnel of vessels from plague or yellow fever ports; freight manifests are examined, baggage of steerage is looked at for certificates of medical officers, the general condition of the vessel as to mechanical cleanliness gone into, and a careful examination made of the source of food and water supply, especially if from cholera ports; the report of the vessel's surgeon, the bill of health and anything else pertinent to the inquiry. In addition to this careful inspection of every person and thing for quarantine, the quarantine officer is charged with the medical inspection of aliens for the Immigration Bureau of the Department of Commerce and Labor, and, as neither this bureau nor the transportation companies provide any other place, this inspection is done aboard ship.

Opened April 29, 1891, the first vessel treated was the *China*, which arrived on December 20th, 1891, with smallpox on board. No sanitary inspection or disinfection of vessels was done by the Federal authorities, these being made by the city quarantine officer who was appointed by the Governor. Neither the State nor the city had any quarantine buildings or modern appliances, and the station was used as the national and local quarantine by the desire of the State and local boards of health.

In 1892 the fumigating steamer *George M. Sternberg* was completed. In 1895 the Legislature of the State passed a joint resolution requesting the Federal government to assume entire control of the maritime quarantine service at the port of San Francisco, meaning the inspection of vessels in addition to the quarantine functions already performed. The Chamber of Commerce of San Francisco passed similar resolutions, and the steamer *George M. Sternberg* was put into commission as boarding steamer.

May 11, 1897, the duty of medical inspection of immigrants was assumed, and after a disagreeable controversy between the local quarantine officer and the commanding officer of this station, the latter was appointed by the President by virtue of the power given him by Section 3, of the Act of February 15, 1893, quarantine officer at the port of San Francisco, California. The following officers have been in command of the station:

Surgeons Preston H. Bailhache, until June 13, 1891; W. P. McIntosh, June 13, 1891, until May 2, 1892; D. A. Carmichael, May 2, 1892, until April 16, 1894; Passed Assistant Surgeons, J. H.

Oakley, April 16, 1894, until June 8, 1894; C. T. Peckham, June 8, 1894, until March 2, 1896; M. J. Roseman, March 2, 1896, until December 6, 1898; Surgeon Brooks, December 6, 1898, until June 17, 1899; J. J. Kinyoun, June 17, 1899, until May 3, 1901; D. A. Carmichael, May 3, 1901, until January 2, 1902, when the writer became quarantine officer at the port of San Francisco.

A FEW ILLUSTRATIVE CASES OF DIPHTHERIA.*

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THE Board of Health of San Francisco has kept complete records of the cases of diphtheria that have occurred in that city since 1896. These records show that the disease is increasing; and that the greatest number of cases recorded in any one year occurred during the last fiscal year, 1901-1902. During that year there were 1357 cases with 204 deaths, or a death rate of 15%. During the six years covered by these records there were 4297 cases of diphtheria and 704 deaths, a death rate of 16.38%.

It is well known that both the morbidity and the mortality from diphtheria are universally greater during the cold winter months than during the summer. Under like conditions of treatment we should therefore expect more favorable results in this climate than in the severe climate of that part of the United States east of the Rocky Mountains. We have failed, however, to achieve as good results. The death rate from diphtheria is now greater in San Francisco than it is in New York, Boston or Chicago. Not only is this true, but the number of deaths is increasing here and decreasing there. There were more than three times as many deaths from diphtheria in San Francisco during the fiscal year 1901-1902 as there were during the year 1896-1897. Whereas the number of deaths from the same disease in the combined population of the five largest cities of the United States was considerably less in 1901 than it was in 1896. During 1901 there was one death from diphtheria in San Francisco for every 1680 of the living; and in the five cities above referred to there was only one death from the same disease for every 2,128 of the living.†

Statistics from all the large hospitals of Europe and the United States prove beyond any possibility of doubt that the death rate from diphtheria properly treated with antitoxin is very much less than it is from that disease treated without antitoxin.

†The combined population of New York, Chicago, Philadelphia, St. Louis and Boston in 1900 was 7,556,586; there were 3555 deaths from diphtheria in those cities in 1901. San Francisco had a population of 342,782 in 1900 and there were 204 deaths from diphtheria in that city during the fiscal year 1901-1902.

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